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REV. 5-93

US DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

# TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEYS DOCKET NUMBER
**P01,0060**

U.S.APPLICATION NO. (if known, see 37 CFR 1.5)
**09/786777**

| INTERNATIONAL APPLICATION NO. | INTERNATIONAL FILING DATE | PRIORITY DATE CLAIMED |
|---|---|---|
| **PCT/DE99/02743** | **01 September 1999** | **15 September 1998** |

TITLE OF INVENTION
**ARRANGEMENT AND METHOD FOR FORMING A TOTAL SIGNAL, ARRANGEMENT AND METHOD FOR FORMING A CURRENT SIGNAL AND A FIRST COMMUNICATION SIGNAL, AND COMMUNICATION SYSTEM AND METHOD FOR TRANSMITTING A FIRST TOTAL SIGNAL AND A SECOND TOTAL SIGNAL**

APPLICANT(S) FOR DO/EO/US
**Askold Meusling**

Applicant herewith submits to the United States /Designated/Elected Office (DO/EO/US) the following items and other information:

1. ■ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. □ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ■ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay.
4. ■ A proper Demand for International Preliminary Examination will be made by the 19th month from the earliest claimed priority date.

5. ■ A copy of International Application as filed (35 U.S.C. 371(c)(2))
   a. ■ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. □ has been transmitted by the International Bureau.
   c. □ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ■ A translation of the International Application into English (35 U.S.C. 371(c)(2).

7. ■ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3))
   a. □ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. □ have been transmitted by the International Bureau.
   c. □ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ■ have not been made and will not be made.

8. □ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

9. ■ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). **Executed**

10. ■ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11. to 16. below concern other document(s) or information included:**

11. ■ An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98; **(PTO 1449, Prior Art, Search Report)**.

12. ■ An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included.
    **(SEE ATTACHED ENVELOPE)**

13. ■ A FIRST preliminary amendment.
    □ A SECOND or SUBSEQUENT preliminary amendment.

14. ■ A substitute specification **- Marked up copy of Substitute Specification**.

15. □ A change of power of attorney and/or address letter.

16. ■ Other items or information:
    a. ■ Submission of Drawings **- Three sheets of drawings - Drawing Correction Letter - Translation of Drawings**

    b. ■ **EXPRESS MAIL #EL655301678US dated March 9, 2001.**

| U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.5) 09/786772 | INTERNATIONAL APPLICATION NO. PCT/DE99/02743 | JC02 Rec'd PCT/PTO 09 MAR 2001 ATTORNEY'S DOCKET NUMBER P01,0060 |
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|---|---|---|---|---|---|
| **BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5):** Search Report has been prepared by the EPO or JPO ..... $860.00<br>International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) ..... $690.00<br>No international preliminary examination fee paid to USPTO (37 C.F.R. 1.482) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2) ..... $760.00<br>Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2) paid to USPTO ..... $970.00<br>International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) ..... $ 96.00 | | | | | |
| **ENTER APPROPRIATE BASIC FEE AMOUNT =** | | | | $860.00 | |
| Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)). | | | | $ 0 | |
| | | | | | |
| Claims | Number Filed | | Number Extra | Rate | |
| Total Claims | 10 | - 20 = | 0 | X $ 18.00 | $ 0 |
| Independent Claims | 3 | - 3 = | 0 | X $ 80.00 | $ 0 |
| Multiple Dependent Claims | | | | $270.00 + | $ |
| **TOTAL OF ABOVE CALCULATIONS =** | | | | | $ 0 |
| Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 C.F.R. 1.9, 1.27, 1.28) | | | | | $ |
| **SUBTOTAL =** | | | | | $ 0 |
| Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). + | | | | | $ |
| **TOTAL NATIONAL FEE =** | | | | | $ 0 |
| Fee for recording the enclosed assignment (37 C.F.R. 1.21(h). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). $40.00 per property + | | | | | |
| **TOTAL FEES ENCLOSED =** | | | | | $860.00 |
| | | | | Amount to be refunded | $ |
| | | | | charged | $ |

a. ■ A check in the amount of $ **860.00** to cover the above fees is enclosed.
b. □ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.
c. ■ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **501519**. A duplicate copy of this sheet is enclosed.

**NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.**

**SEND ALL CORRESPONDENCE TO:**

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BOX PCT

IN THE UNITED STATES ELECTED OFFICE

OF THE UNITED STATES PATENT AND TRADEMARK OFFICE

UNDER THE PATENT COOPERATION TREATY-CHAPTER II

**PRELIMINARY AMENDMENT**

APPLICANT: Askold MEUSLING

DOCKET NO: P01,0060

SERIAL NO: GROUP ART UNIT:

EXAMINER:

INTERNATIONAL APPLICATION NO: PCT/DE99/02743

INTERNATIONAL FILING DATE: 01 September 1999

INVENTION: **"ARRANGEMENT AND METHOD FOR FORMING A TOTAL SIGNAL, ARRANGEMENT AND METHOD FOR FORMING A CURRENT SIGNAL AND A FIRST COMMUNICATION SIGNAL, AND COMMUNICATION SYSTEM AND METHOD FOR TRANSMITTING A FIRST TOTAL SIGNAL AND A SECOND TOTAL SIGNAL"**

Assistant Commissioner for Patents,
Washington, D.C. 20231

Sir:

As a Preliminary Amendment for entry into the National Stage for the above-identified PCT application, the following is submitted:

**IN THE DRAWINGS:**

Please amend the drawings as indicated in the attached Drawing Correction Letter.

**IN THE SPECIFICATION AND ABSTRACT:**

Enclosed is a Substitute Specification and Abstract with amendments incorporated therein. No new matter is added. A marked-up copy of the specification and abstract is also enclosed.

**IN THE DRAWINGS:**

Please amend the drawings as indicated in the attached Drawing Correction Letter.

**IN THE CLAIMS:**

On amended page 16 of the claims, delete "Patent Claims" and substitute --**I CLAIM AS MY INVENTION**--.

Please cancel claims 1-9 without prejudice.

Please substitute claims 15-24 as follows:

15. A communication system, comprising:

an energy supply network that makes a current signal available;

a first communication unit that makes a first communication signal available with first payload data that require a large, first bandwidth in the transmission;

a second communication unit that makes a second communication signal available with second payload data different from the first payload data and that require a smaller, second bandwidth compared to the first bandwidth;

a first modulation unit with which the first communication signal is modulated onto the current signal in a first frequency range;

a second modulation unit with which the second communication signal is modulated onto the current signal in a second frequency range; and

the modulation units being configured such that, when the communication signals are modulated, the first frequency range at least partially comprises a frequency range of frequencies higher than the second frequency range, and in that the modulation of the first communication signal is implemented in the first frequency range such that a quality of the first payload data does not fall below a predetermined quality given a transmission of the current signal with the first communication signal modulated thereonto via a first transmission path in the energy supply network.

16. The communication system according to claim 15 wherein the second payload data are a request message and the first payload data are a reply message.

17. The communication system according to claim 15 wherein the payload data are encoded according to a transport control protocol/Internet protocol TCP/IP.

18. The communication system according to claim 15 wherein the first transmission path is part of the energy supply network in a building.

19. The communication system according to claim 15 wherein the current signal with the second communication signal modulated thereon is transmitted via a second transmission path in the energy supply network.

20. The communication system according to claim 19 wherein the second transmission path is far, far greater than the first transmission path.

21. The communication system according to claim 19 wherein at least one of the first communication unit and the second communication unit is part of a communication network.

22. The communication system according to claim 21 wherein the communication network is a worldwide web WWW.

23. A method for forming an overall signal from a current signal and at least one of a first communication signal with first payload data that require a large first bandwidth in transmission and a second communication signal with second payload data differing from the first payload data that require a smaller second bandwidth compared to the first bandwidth, comprising the steps of:

modulating at least one of the first communication signal in a first frequency range and the second communication signal in a second frequency range onto the current signal;

the first frequency range at least partially comprising a frequency range of frequencies higher than the second frequency range; and

providing the modulation of the first communication signal in the first frequency range such that a quality of the first payload data does not fall below a predetermined quality given a transmission of the current signal with the first communication signal modulated thereonto via a first transmission path in the energy supply network.

24. A method for forming an overall signal from a current signal and at least one of a first communication signal with first payload data as a reply message that require a large first bandwidth in transmission and a second communication signal with second payload data as a request message differing from the first payload data that require a smaller second bandwidth compared to the first bandwidth comprising the steps of:

encoding the payload data according to a transport control protocol/Internet protocol TCP/IP;

modulating at least one of the first communication signal in a first frequency range and the second communication signal in a second frequency range onto the current signal;

the first frequency range at least partially comprising a frequency range of frequencies higher than the second frequency range; and

providing the modulation of the first communication signal in the first frequency range such that a quality of the first payload data does not fall below a predetermined quality given a transmission of the current signal with the first communication signal modulated thereonto via a first transmission path in the energy supply network.

**REMARKS**

The specification, abstract and drawings have been amended in accordance with U. S. practice.

New claims are presented corresponding to the PCT claims but drawn in accordance with U. S. practice. These amendments do not narrow the claims and were not made for patentability reasons pursuant to the Festo decision.

Respectfully submitted,

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## Abstract

**Arrangement and method for forming a total signal, arrangement and method for forming a current signal and a first communication signal, communication system and method for transmitting a first total signal and a second total signal**

When forming the total signal for the first communication signal, a first frequency range is provided, and for a second communication signal, which second communication signal can be modulated onto the current signal, a second frequency range is provided, at least part of the first frequency range comprising a frequency range of higher frequencies than the second frequency range.

# SPECIFICATION

## TITLE

# ARRANGEMENT AND METHOD FOR FORMING A TOTAL SIGNAL, ARRANGEMENT AND METHOD FOR FORMING A CURRENT SIGNAL AND A FIRST COMMUNICATION SIGNAL, COMMUNICATION SYSTEM AND METHOD FOR TRANSMITTING A FIRST TOTAL SIGNAL AND A SECOND TOTAL SIGNAL

## BACKGROUND OF THE INVENTION

The invention relates to an arrangement and a method for forming a total signal from a current signal and a first communication signal, and to an arrangement and a method for forming a current signal and a first communication signal from a total signal, and also to a communication system and a method for transmitting a first total signal and a second total signal in a communication system.

Such apparatuses and arrangements and also such a communication system are known from GB 2 272 350 B. Such an apparatus has a connection at which an electrical total signal can be tapped off. The total signal has a current signal (carrier frequency signal) and an electrical signal which is modulated onto the current signal. The electrical signal modulated on is a communication signal.

A communication signal is to be understood as meaning an electrical signal which permits transmission of electronic data, for example the transmission of textual data, image data or video data.

In principle, any type of modulation can be used for the modulation, i.e. amplitude modulation, frequency modulation or else phase modulation.

This means that, using a normal power supply network supplying an arbitrary number of customers with, by way of example, a three-phase AC voltage at a frequency of 50 Hz, it is also possible to transmit

electronic data for communication purposes (communication signal), which permits the use of a power supply network in the field of data transmission.

The apparatus known from GB 2 272 3350 B has a coupling element which is coupled to the power supply network. In the coupling element, the communication signal is obtained from the total signal in a first operating mode. In a second operating mode, the communication signal is modulated onto the current signal, thus forming the total signal.

In addition, a second connection is provided which is connected to the coupling element. Depending on the operating mode of the coupling element, the communication signal can be tapped off at or supplied to the second connection.

Thus, a communication signal which is to be modulated and represents the communication data is present on the second connection, or is supplied thereto.

In addition, D. Clark, Powerline Communications: Finally ready for prime time?, IEEE Internet Computing, January, February 1998, pages 10-11, 1998 discloses the practice of using such an apparatus in a scenario shown in Figure 2.

Figure 2 shows a power supply network 201 to which a house 202 is connected.

In addition, a base station 203 known from Prospectus from the company Northern Telekom und Norweb, Digital Powerline: a major new business opportunity for power utilities worldwide, Communications Digital Power Line, published March 18, 1998 is connected to the power supply network 201 via an interface 204.

The base station 203 is connected to a communication network 206 via a network interface 205.

The base station 203 has a processor 207 which is connected by means of a bus 208 to data conversion cards 209 (likewise known from Northern Telekom, supra, which, for their part, are connected to the interface 204 by means of coaxial lines 210. In addition, a medium voltage/low voltage transformer element 211 is provided in the power supply network 201.

A medium voltage is to be understood below as meaning a voltage of a few kilovolts (KV), usually 10 KV, and a low voltage is to be understood as meaning a normal operating voltage with a size of approx. 230 V.

The house 202 is connected to the power supply network 201 via a house interface 212.

The house interface 212 is connected to the known apparatus described above, which is denoted by 213 in Figure 2.

The base station 203 modulates a communication signal, called the signal which is to be modulated below, onto a low voltage signal which is transmitted on power lines 214 in the power supply network 201.

The low voltage signal is called the carrier frequency signal below. The carrier frequency signal is usually at 220 V and has a frequency of 50 Hz.

Thus, a first signal 215, comprising the carrier frequency signal 220 and a communication signal 221, which is generated by the base station 203 and is modulated onto the carrier frequency signal, is supplied to the house 202 via the lines 214.

The first signal is supplied to the apparatus 213 described above via the house interface 212.

In the apparatus 213, the carrier frequency signal 220 is supplied to an electric meter 216 in a known manner, and the modulated signal 221, which has been demodulated from the carrier frequency signal, is

supplied via a coaxial line 217 to a first computer 218 and to a second computer 219.

A disadvantage of this scenario is that the coaxial cable 217 in each case needs to be laid for each computer unit 218, 219 in the house 202 from the apparatus 213, i.e. new lines need to be laid in the house 202 in each room in which there is a computer, in order to permit data communication via the power supply network 201. This results in considerable additional effort when planning the house 202, and also results in considerable inflexibility for planning and furnishing the house 202.

It is also known practice for the communication signal to be modulated onto the current signal in a frequency range of a few MHZ, usually in the range between 1 MHZ and approximately 8 MHZ.

The reason for limiting the frequency range lies in the attenuation profile of the transmission medium used. At approximately 8 MHZ, the attenuation of the communication signal is so high that it becomes impossible to transmit the communication signal over relatively long distances. To transmit a signal requiring a relatively high bandwidth, a dedicated transmission medium, for example a coaxial cable, is used.

The invention is thus based on the problem of specifying an arrangement and a method for forming a total signal from a current signal and a first communication signal and also an arrangement and a method for forming a current signal and a first communication signal from a total signal, which arrangement and method achieve a higher level of flexibility for planning and furnishing a house, and also achieve improved use of bandwidth.

The invention is also based on the problem of specifying a communication system and a method for

transmitting a first total signal and a second total signal in a communication system, which communication system and method achieve a higher level of flexibility for planning and furnishing a house, and also achieve improved use of bandwidth.

A method is provided for forming an overall signal from a current signal in at least one of a first communication signal with first payload data that require a large first bandwidth in transmission and a second communication signal with second payload data differing from the first payload data that require a smaller second bandwidth compared to the first bandwidth. The first communication signal is modulated onto the current signal in a first frequency range and the second communication signal is modulated onto the current signal in a second frequency range. The first frequency range at least partially comprises a frequency range of frequencies higher than the second frequency range. The modulation of the first communication signal occurs in the first frequency range such that a quality of the first payload data does not fall below a predetermined quality given a transmission of the current signal with the first communication signal modulated thereonto via a first transmission path in the energy supply network.

An arrangement for forming a total signal from a current signal and a first communication signal comprises the following features:

a) a first connection, to which the current signal can be supplied,

b) a second connection, to which the first communication signal can be supplied,

c) a total connection, at which the total signal can be tapped off,

d) a coupling element for forming the total signal from the current signal and the first communication

signal, which coupling element is coupled to the first connection, to the second connection and to the total connection, and

e) the coupling element being set up such that, when forming the total signal for the first communication signal, a first frequency range is provided, and for a second communication signal, which second communication signal can be modulated onto the current signal, a second frequency range is provided, at least part of the first frequency range comprising a frequency range of frequencies higher than the second frequency range.

An arrangement for forming a current signal and a first communication signal from a total signal comprises the following features:

a) a first connection, at which the current signal can be tapped off,

b) a second connection, at which the first communication signal can be tapped off,

c) a total connection, to which the total signal can be supplied,

d) a coupling element for forming the current signal and the first communication signal from the total signal, which coupling element is coupled to the first connection, to the second connection and to the total connection, and

e) the coupling element being set up such that, when the first communication signal is formed, a first frequency range is provided and a second frequency range is provided for a second communication signal, which second communication signal can be modulated onto the current signal, at least part of the first frequency range comprising a frequency range of higher frequencies than the second frequency range.

A communication system having a first communication unit, a second communication unit and a

power supply network which provides a current signal has the following features:
a first frequency range is provided for a first communication signal, which is formed by the first communication unit and is added to the current signal in order to form a first total signal, and
a second frequency range is provided for a second communication signal, which is formed by the second communication unit and is added to the current signal in order to form a second total signal,
at least part of the first frequency range comprises a frequency range of higher frequencies than the second frequency range.

In a method for forming a total signal from a current signal and a first communication signal, when forming the total signal for the first communication signal, a first frequency range is provided, and for a second communication signal, which second communication signal can be modulated onto the current signal, a second frequency range is provided, at least part of the first frequency range comprising a frequency range of higher frequencies than the second frequency range.

In a method for forming a current signal and a first communication signal from a total signal, when the first communication signal is formed, a first frequency range is provided and a second frequency range is provided for a second communication signal, which second communication signal can be modulated onto the current signal, at least part of the first frequency range comprising a frequency range of higher frequencies than the second frequency range.

A method for transmitting a first total signal and a second total signal in a communication system having a first communication unit, a second communication unit and a power supply network which provides a current signal comprises the following features:

- the first communication unit forms a first communication signal, which is added to the current signal in order to form a first total signal,

- a first frequency range is provided for the first communication signal in the first total signal,

- the first total signal is transmitted to the second communication unit,

- the second communication unit forms a second communication signal, which is added to the current signal in order to form a second total signal,

- a second frequency range is provided for the second communication signal in the second total signal,

- the second total signal is transmitted to the first communication unit, and

- at least part of the first frequency range comprises a frequency range of higher frequencies than the second frequency range.

The invention can clearly be regarded as the communication signal's being modulated onto the current signal in a frequency range which, at least in part, contains frequencies which are higher than the frequencies of the frequency range in which the communication signal has been transmitted previously. In this context, it has been recognized that, particularly in the case of a relatively large house with a plurality of residential units, within each residential unit, a distance needs to be bridged between the residential unit's respective connection to the power supply network and a computer unit which is short enough for the attenuation to be not too high which would prevent transmission of the communication signal.

In this way, a higher level of flexibility for planning and furnishing a house and also optimized use of available bandwidth are achieved.

Preferably, the second communication signal is modulated onto the current signal in the second frequency range.

In addition, the arrangements in one development are provided with a modulation/demodulation unit which is coupled to the total connection and can be used to modulate the first communication signal and/or the second communication signal onto the current signal, thus forming the total signal, or can be used to demodulate the first communication signal and/or the second communication signal from the current signal.

The modulation/demodulation unit is preferably coupled to an electrical appliance, and the electrical appliance may be a computer (computer unit).

An illustrative embodiment of the invention is shown in the figures and is explained in more detail below.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 shows a sketch of a conversion unit based on the illustrative embodiment;

Figure 2 shows a sketch of a power supply network having a base station and a house, connected to the power supply network, with an apparatus based on the prior art;

Figure 3 shows a sketch of a power supply network having a base station and a house, connected to the power supply network, with an apparatus based on the illustrative embodiment; and

Figure 4 shows a sketch of a graph used to describe an attenuation profile for the frequencies used for modulating the second communication signal 401 and the first communication signal 402.

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the preferred embodiment illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications

of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

Like Fig. 2, Fig. 3 shows, using the same reference symbols for the same components, the base station 203 connected to the power supply network 201 via the interface 204. In addition, the house 202 is connected to the power supply network 201 via the house connection 212.

Fig. 3 shows the house 202 with a first residential unit 301 and a second residential unit 310. The first residential unit 301 contains a first computer 302, and the second residential unit 310 contains a second computer 311.

The first computer 302 is connected by means of a communication cable 303 to a first modulation/demodulation unit 304, described below. A second power cable 305 connects the first modulation/demodulation unit 304 to a first conversion unit 306, which is likewise described below.

The second computer 311 is connected by means of a third power cable 312 to a second modulation/demodulation unit 313 (described below), the second modulation/demodulation unit 313 being in the same form as the first modulation/demodulation unit 304. A fourth power cable 314 connects the second modulation/demodulation unit 313 to a second conversion unit 315 (which is likewise described below), the second conversion unit 315 being in the same form as the first conversion unit 306.

The design of the first conversion unit 306, 100 is shown in Fig. 1.

The first conversion unit 306, 100 has a first connection 101, at which a current signal 102 can be supplied or tapped off, depending on the operating mode. In a first operating mode, a second communication signal is modulated onto the current signal 102 as a carrier frequency signal.

In the first operating mode, communication (described below) takes place from the first computer 302 to the power supply network 201 and the communication network 206.

In a second operating mode, the communication (described below) takes place from the power supply network 201 and the communication network 206 to the first computer 302.

In addition, the first conversion unit 306, 100 has a second connection 103, at which a first communication signal 104 can be supplied or tapped off, depending on operating mode.

The first conversion unit 306, 100 also has a total connection 105, at which a total signal 106 can be supplied or tapped off, depending on operating mode.

In the first operating mode, the total signal 106 contains the current signal 102 as carrier frequency signal, and also the second communication signal, modulated onto the current signal 102. The second communication signal is modulated onto the current signal 102 in a second frequency range of approximately one to approximately four-eight MHZ.

Fig. 4 shows a sketch of a graph 400 used to describe an attenuation profile 403 for the modulation frequencies of the second communication signal 401 and of the first communication signal 402 with rising frequency 404.

The attenuation is described in the unit of decibels (dB).

The graph 400 shows the transmission properties of the power distribution network 201, 305, 314 in the frequency range, where the relatively long distances in the network 201 mean that only modulation frequencies of up to approximately 1 to 8 MHZ can be used for the second communication signal 401 on account of the attenuation, and, furthermore, a second communication signal can no longer be transmitted. Over a relatively short distance, for the distance from the first conversion unit 306 or from the second conversion unit 315 to the first computer 302 or to the second computer 311 within the context of this illustrative embodiment, modulation frequencies of up to approximately 20 to 30 MHZ can be used, which means that there is much more bandwidth available for the first communication signal 402. This is described by the attenuation profile for the first communication signal 402. In this case, the

attenuation first increases in a range of approximately 10 to 20 MHZ, and only at 20 MHZ does it become so high that the modulation frequencies of the first communication signal 401 can no longer be transmitted.

The range from approximately 10 to 20 Mbps (Megabit per second) is called the first frequency range below.

On the basis of this knowledge, the first conversion unit 306 is set up such that, in the second operating mode, the total signal 106 has the current signal 102 as a carrier frequency signal and the first communication signal 402, 104, which is modulated onto the current signal 102.

The first communication signal 402, 104 is modulated onto the current signal 102 in the first frequency range, i.e. the first communication signal 402 is transmitted within a residential unit using a respective frequency range containing frequencies which are higher than the frequencies in the second frequency range.

This achieves optimized utilization of available bandwidth.

The first conversion unit 306 also has a coupling element 107 coupled to the first connection 101, to the second connection 103 and to the total connection 105.

The coupling element 107 contains a circuit arrangement 108 which is set up such that, in the first operating mode, the first communication signal 104, 402 is modulated onto the current signal 102 in the first frequency range, thus forming the total signal 106.

In addition, the coupling element 107 is set up such that, in the second operating mode, the second communication signal 401, which is modulated onto the current signal 102 in the second frequency range, is supplied via a network to a converter/demodulator unit 203 which is connected to the central connection 320.

In the central connection 320, the first communication signal 402 and the second communication signal 401 are combined in a manner known per se and are supplied to the communication network 206.

The rest of the explanations clarify the interaction of the individual components further.

It is assumed that the first computer 302 transmits a request message 330 using the Transport Control Protocol/Internet Protocol (TCP/IP). The request message 330 is used to request information from the Internet, which is the form taken by the communication network 206. The request message 330 is supplied to the first modulation/demodulation unit 304. In the first modulation/demodulation unit 304, the request message 330 is modulated as second communication signal 401 onto the current signal 102, thus forming the total signal 506. The modulation is effected in the second frequency range.

The total signal 106 is supplied via the second power cable 305 to the total connection 105 of the first conversion unit 306, 100 by the first modulation/demodulation unit 304.

Within the context of this first operating mode, the first conversion unit 306, 100 connects the total signal 106 to a first connecting cable 340, which is connected to a power supply network as shown in Figure 2, via the first connection 101 as current signal 102 with the second communication signal 401 modulated thereon, and transmits it within this power supply network as second communication signal modulated onto the current signal. Arranged within this power supply network is a device 203 which demodulates the second communication signal, modulated onto the current signal, and supplies the request message 330 to the central connection 320.

In the central connection 320, which can be situated at an arbitrary point in the power supply

network, the request message 330 is supplied to the communication network 206.

Connected to the communication network 206 are further computers 360, 361, 362, 363, ...

The request message 330 is transmitted to the further computer 360, 361, 362, 363 to which it has been directed on the basis of the unique Internet address (IP address), in this example to a first further computer 360, which is set up as an Internet server.

Once the request message 330 has been received, the first further computer 360 forms a response message 370 containing the information requested by the first computer 302.

The first further computer 360 transmits the response message 370 to the first computer 302. The response message 370 is supplied to the central connection 320 via the communication network 206.

Within the context of this second operating mode, the response message 370 is supplied from the central connection 320 via a second connection cable 350 to the first conversion unit 306, which is likewise connected to the second connecting cable 350, as first communication signal 402.

In the first conversion unit 306, the first communication signal 402 is modulated onto the current signal 102, thus forming the total signal 106.

The first communication signal 402 is modulated in the first frequency range.

The total signal 106 is supplied to the first modulation/demodulation unit 304. In the first modulation/demodulation unit 304, the response message 370 is demodulated from the total signal 106 as first communication signal 402 and is supplied to the first computer 302.

One alternative among many to the illustrative embodiment is as follows. The communication protocol used for transmitting the digital data may be any

desired communication protocol, i.e. the method and arrangements are not limited to the communication protocol based on the TCP/IP standard.

While the invention has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that only the preferred embodiment has been shown and described and that all changes and modifications that come within the spirt of the invention are desired to be protected

## ABSTRACT OF THE DISCLOSURE

In an arrangement and method for forming a total signal, an arrangement and method for forming a current signal and a first communication signal, and a communication system and method for transmitting a first total signal and a second total signal, when forming the total signal for the first communication signal, a first frequency range is provided. For a second communication signal, which second communication signal can be modulated onto the current signal, a second frequency range is provided. At least part of the first frequency range comprising a frequency range of higher frequencies than the second frequency range.

GR 98 P 2565

## Description

# Arrangement and method for forming a total signal, arrangement and method for forming a current signal and a first communication signal, communication system and method for transmitting a first total signal and a second total signal

The invention relates to an arrangement and a method for forming a total signal from a current signal and a first communication signal, and to an arrangement and a method for forming a current signal and a first communication signal from a total signal, and also to a communication system and a method for transmitting a first total signal and a second total signal in a communication system.

Such apparatuses and arrangements and also such a communication system are known from [1]. Such an apparatus has a connection at which an electrical total signal can be tapped off. The total signal has a current signal (carrier frequency signal) and an electrical signal which is modulated onto the current signal. The electrical signal modulated on is a communication signal.

A communication signal is to be understood as meaning an electrical signal which permits transmission of electronic data, for example the transmission of textual data, image data or video data.

In principle, any type of modulation can be used for the modulation, i.e. amplitude modulation, frequency modulation or else phase modulation.

This means that, using a normal power supply network supplying an arbitrary number of customers with, by way of example, a three-phase AC voltage at a frequency of 50 Hz, it is also possible to transmit electronic data for communication purposes

(communication signal), which permits the use of a power supply network in the field of data transmission.

The apparatus known from [1] has a coupling element which is coupled to the power supply network. In the coupling element, the communication signal is obtained from the total signal in a first operating mode. In a second operating mode, the communication signal is modulated onto the current signal, thus forming the total signal.

In addition, a second connection is provided which is connected to the coupling element. Depending on the operating mode of the coupling element, the communication signal can be tapped off at or supplied to the second connection.

Thus, a communication signal which is to be modulated and represents the communication data is present on the second connection, or is supplied thereto.

In addition, [2] discloses the practice of using such an apparatus in a scenario shown in **Figure 2**.

**Figure 2** shows a power supply network 201 to which a house 202 is connected.

In addition, a base station 203 known from [3] is connected to the power supply network 201 via an interface 204.

The base station 203 is connected to a communication network 206 via a network interface 205.

The base station 203 has a processor 207 which is connected by means of a bus 208 to data conversion cards 209 (likewise known from [3]) which, for their part, are connected to the interface 204 by means of coaxial lines 210. In addition, a medium voltage/low voltage transformer element 211 is provided in the power supply network 201.

A medium voltage is to be understood below as meaning a voltage of a few kilovolts (KV), usually 10 KV, and a low voltage is to be understood as meaning

a normal operating voltage with a size of approx. 230 V.

The house 202 is connected to the power supply network 201 via a house interface 212.

The house interface 212 is connected to the known apparatus described above, which is denoted by 213 in **Figure 2**.

The base station 203 modulates a communication signal, called the signal which is to be modulated below, onto a low voltage signal which is transmitted on power lines 214 in the power supply network 201.

The low voltage signal is called the carrier frequency signal below. The carrier frequency signal is usually at 220 V and has a frequency of 50 Hz.

Thus, a first signal 215, comprising the carrier frequency signal 220 and a communication signal 221, which is generated by the base station 203 and is modulated onto the carrier frequency signal, is supplied to the house 202 via the lines 214.

The first signal is supplied to the apparatus 213 described above via the house interface 212.

In the apparatus 213, the carrier frequency signal 220 is supplied to an electric meter 216 in a known manner, and the modulated signal 221, which has been demodulated from the carrier frequency signal, is supplied via a coaxial line 217 to a first computer 218 and to a second computer 219.

A disadvantage of this scenario is that the coaxial cable 217 in each case needs to be laid for each computer unit 218, 219 in the house 202 from the apparatus 213, i.e. new lines need to be laid in the house 202 in each room in which there is a computer, in order to permit data communication via the power supply network 201. This results in considerable additional effort when planning the house 202, and also results in considerable inflexibility for planning and furnishing the house 202.

It is also known practice for the communication signal to be modulated onto the current signal in a frequency range of a few MHZ, usually in the range between 1 MHZ and approximately 8 MHZ.

The reason for limiting the frequency range lies in the attenuation profile of the transmission medium used. At approximately 8 MHZ, the attenuation of the communication signal is so high that it becomes impossible to transmit the communication signal over relatively long distances. To transmit a signal requiring a relatively high bandwidth, a dedicated transmission medium, for example a coaxial cable, is used.

The invention is thus based on the problem of specifying an arrangement and a method for forming a total signal from a current signal and a first communication signal and also an arrangement and a method for forming a current signal and a first communication signal from a total signal, which arrangement and method achieve a higher level of flexibility for planning and furnishing a house, and also achieve improved use of bandwidth.

The invention is also based on the problem of specifying a communication system and a method for transmitting a first total signal and a second total signal in a communication system, which communication system and method achieve a higher level of flexibility for planning and furnishing a house, and also achieve improved use of bandwidth.

The problem is solved by the arrangements and methods in accordance with the features of the independent patent claims.

An arrangement for forming a total signal from a current signal and a first communication signal comprises the following features:

a) a first connection, to which the current signal can be supplied,

b) a second connection, to which the first communication signal can be supplied,

c) a total connection, at which the total signal can be tapped off,

d) a coupling element for forming the total signal from the current signal and the first communication signal, which coupling element is coupled to the first connection, to the second connection and to the total connection,

e) the coupling element being set up such that, when forming the total signal for the first communication signal, a first frequency range is provided, and for a second communication signal, which second communication signal can be modulated onto the current signal, a second frequency range is provided, at least part of the first frequency range comprising a frequency range of higher frequencies than the second frequency range.

An arrangement for forming a current signal and a first communication signal from a total signal comprises the following features:

a) a first connection, at which the current signal can be tapped off,

b) a second connection, at which the first communication signal can be tapped off,

c) a total connection, to which the total signal can be supplied,

d) a coupling element for forming the current signal and the first communication signal from the total signal, which coupling element is coupled to the first connection, to the second connection and to the total connection,

e) the coupling element being set up such that, when the first communication signal is formed, a first frequency range is provided and a second frequency range is provided for a second communication signal, which second communication signal can be modulated onto the current signal, at least part of the first

frequency range comprising a frequency range of higher frequencies than the second frequency range.

A communication system having a first communication unit, a second communication unit and a power supply network which provides a current signal has the following features:
a first frequency range is provided for a first communication signal, which is formed by the first communication unit and is added to the current signal in order to form a first total signal,
a second frequency range is provided for a second communication signal, which is formed by the second communication unit and is added to the current signal in order to form a second total signal,
at least part of the first frequency range comprises a frequency range of higher frequencies than the second frequency range.

In a method for forming a total signal from a current signal and a first communication signal, when forming the total signal for the first communication signal, a first frequency range is provided, and for a second communication signal, which second communication signal can be modulated onto the current signal, a second frequency range is provided, at least part of the first frequency range comprising a frequency range of higher frequencies than the second frequency range.

In a method for forming a current signal and a first communication signal from a total signal, when the first communication signal is formed, a first frequency range is provided and a second frequency range is provided for a second communication signal, which second communication signal can be modulated onto the current signal, at least part of the first frequency range comprising a frequency range of higher frequencies than the second frequency range.

A method for transmitting a first total signal and a second total signal in a communication system having a first communication unit, a second communication unit and a power supply network which

provides a current signal comprises the following features:

- the first communication unit forms a first communication signal, which is added to the current signal in order to form a first total signal,

- a first frequency range is provided for the first communication signal in the first total signal,

- the first total signal is transmitted to the second communication unit,

- the second communication unit forms a second communication signal, which is added to the current signal in order to form a second total signal,

- a second frequency range is provided for the second communication signal in the second total signal,

- the second total signal is transmitted to the first communication unit,

- at least part of the first frequency range comprises a frequency range of higher frequencies than the second frequency range.

The invention can clearly be regarded as the communication signal's being modulated onto the current signal in a frequency range which, at least in part, contains frequencies which are higher than the frequencies of the frequency range in which the communication signal has been transmitted previously. In this context, it has been recognized that, particularly in the case of a relatively large house with a plurality of residential units, within each residential unit, a distance needs to be bridged between the residential unit's respective connection to the power supply network and a computer unit which is short enough for the attenuation not yet to be high enough for transmission of the communication signal not to be possible after all.

In this way, a higher level of flexibility for planning and furnishing a house and also optimized use of available bandwidth are achieved.

Preferred developments of the invention can be found in the dependent claims.

Preferably, the second communication signal is modulated onto the current signal in the second frequency range.

In addition, the arrangements in one development are provided with a modulation/demodulation unit which is coupled to the total connection and can be used to modulate the first communication signal and/or the second communication signal onto the current signal, thus forming the total signal, or can be used to demodulate the first communication signal and/or the second communication signal from the current signal.

The modulation/demodulation unit is preferably coupled to an electrical appliance, and the electrical appliance may be a computer (computer unit).

An illustrative embodiment of the invention is shown in the figures and is explained in more detail below.

In the figures

**Figure 1** shows a sketch of a conversion unit based on the illustrative embodiment;

**Figure 2** shows a sketch of a power supply network having a base station and a house, connected to the power supply network, with an apparatus based on the prior art;

**Figure 3** shows a sketch of a power supply network having a base station and a house, connected to the power supply network, with an apparatus based on the illustrative embodiment;

**Figure 4** shows a sketch of a graph used to describe an attenuation profile for the frequencies used for modulating the second communication signal 401 and the first communication signal 402.

Like **Figure 2**, **Figure 3** shows, using the same reference symbols for the same components, the base station 203 connected to the power supply network 201 via the interface 204. In addition, the house 202 is

connected to the power supply network 201 via the house connection 212.

**Figure 3** shows the house 202 with a first residential unit 301 and a second residential unit 310. The first residential unit 301 contains a first computer 302, and the second residential unit 310 contains a second computer 311.

The first computer 302 is connected by means of a communication cable 303 to a first modulation/demodulation unit 304, described below. A second power cable 305 connects the first modulation/demodulation unit 304 to a first conversion unit 306, which is likewise described below.

The second computer 311 is connected by means of a third power cable 312 to a second modulation/demodulation unit 313 (described below), the second modulation/demodulation unit 313 being in the same form as the first modulation/demodulation unit 304. A fourth power cable 314 connects the second modulation/demodulation unit 313 to a second conversion unit 315 (which is likewise described below), the second conversion unit 315 being in the same form as the first conversion unit 306.

The design of the first conversion unit 306, 100 is shown in **Figure 1**.

The first conversion unit 306, 100 has a first connection 101, at which a current signal 102 can be supplied or tapped off, depending on the operating mode. In a first operating mode, a second communication signal is modulated onto the current signal 102 as carrier frequency signal.

In the first operating mode, communication (described below) takes place from the first computer 302 to the power supply network 201 and the communication network 206.

In a second operating mode, the communication (described below) takes place from the power supply network 201 and the communication network 206 to the first computer 302.

In addition, the first conversion unit 306, 100 has a second connection 103, at which a first communication signal 104 can be supplied or tapped off, depending on operating mode.

The first conversion unit 306, 100 also has a total connection 105, at which a total signal 106 can be supplied or tapped off, depending on operating mode.

In the first operating mode, the total signal 106 contains the current signal 102 as carrier frequency signal, and also the second communication signal, modulated onto the current signal 102. The second communication signal is modulated onto the current signal 102 in a second frequency range of approximately one to approximately four-eight MHZ.

**Figure 4** shows a sketch of a graph 400 used to describe an attenuation profile 403 for the modulation frequencies of the second communication signal 401 and of the first communication signal 402 with rising frequency 404.

The attenuation is described in the unit of decibels (dB).

The graph 400 shows the transmission properties of the power distribution network 201, 305, 314 in the frequency range, where the relatively long distances in the network 201 mean that only modulation frequencies of up to approximately 1 to 8 MHZ can be used for the second communication signal 401 on account of the attenuation, and, furthermore, a second communication signal can no longer be transmitted. Over a relatively short distance, for the distance from the first conversion unit 306 or from the second conversion unit 315 to the first computer 302 or to the second computer 311 within the context of this illustrative embodiment, modulation frequencies of up to approximately 20 to 30 MHZ can be used, which means that there is much more bandwidth available for the first communication signal 402. This is described by the attenuation profile for the first communication signal 402. In this case, the attenuation first increases in a range of approximately

10 to 20 MHZ, and only at 20 MHZ does it become so high that the modulation frequencies of the first communication signal 401 can no longer be transmitted.

The range from approximately 10 to 20 Mbps (Megabit per second) is called the first frequency range below.

On the basis of this knowledge, the first conversion unit 306 is set up such that, in the second operating mode, the total signal 106 has the current signal 102 as carrier frequency signal and the first communication signal 402, 104, which is modulated onto the current signal 102.

The first communication signal 402, 104 is modulated onto the current signal 102 in the first frequency range, i.e. the first communication signal 402 is transmitted within a residential unit using a respective frequency range containing frequencies which are higher than the frequencies in the second frequency range.

This achieves optimized utilization of available bandwidth.

The first conversion unit 306 also has a coupling element 107 coupled to the first connection 101, to the second connection 103 and to the total connection 105.

The coupling element 107 contains a circuit arrangement 108 which is set up such that, in the first operating mode, the first communication signal 104, 402 is modulated onto the current signal 102 in the first frequency range, thus forming the total signal 106.

In addition, the coupling element 107 is set up such that, in the second operating mode, the second communication signal 401, which is modulated onto the current signal 102 in the second frequency range, is supplied via a network to a converter/demodulator unit 203 which is connected to the central connection 320.

In the central connection 320, the first communication signal 402 and the second communication

signal 401 are combined in a manner known per se and are supplied to the communication network 206.

The rest of the explanations clarify the interaction of the individual components further.

It is assumed that the first computer 302 transmits a request message 330 using the Transport Control Protocol/Internet Protocol (TCP/IP). The request message 330 is used to request information from the Internet, which is the form taken by the communication network 206. The request message 330 is supplied to the first modulation/demodulation unit 304. In the first modulation/demodulation unit 304, the request message 330 is modulated as second communication signal 401 onto the current signal 102, thus forming the total signal 506. The modulation is effected in the second frequency range.

The total signal 106 is supplied via the second power cable 305 to the total connection 105 of the first conversion unit 306, 100 by the first modulation/demodulation unit 304.

Within the context of this first operating mode, the first conversion unit 306, 100 connects the total signal 106 to a first connecting cable 340, which is connected to a power supply network as shown in Figure 2, via the first connection 101 as current signal 102 with the second communication signal 401 modulated on, and transmits it within this power supply network as second communication signal modulated onto the current signal. Arranged within this power supply network is a device 203 which demodulates the second communication signal, modulated onto the current signal, and supplies the request message 330 to the central connection 320.

In the central connection 320, which can be situated at an arbitrary point in the power supply network, the request message 330 is supplied to the communication network 206.

Connected to the communication network 206 are further computers 360, 361, 362, 363, ...

The request message 330 is transmitted to the further computer 360, 361, 362, 363 to which it has been directed on the basis of the unique Internet address (IP address), in this example to a first further computer 360, which is set up as an Internet server.

Once the request message 330 has been received, the first further computer 360 forms a response message 370 containing the information requested by the first computer 302.

The first further computer 360 transmits the response message 370 to the first computer 302. The response message 370 is supplied to the central connection 320 via the communication network 206.

Within the context of this second operating mode, the response message 370 is supplied from the central connection 320 via a second connection cable 350 to the first conversion unit 306, which is likewise connected to the second connecting cable 350, as first communication signal 402.

In the first conversion unit 306, the first communication signal 402 is modulated onto the current signal 102, thus forming the total signal 106.

The first communication signal 402 is modulated in the first frequency range.

The total signal 106 is supplied to the first modulation/demodulation unit 304. In the first modulation/demodulation unit 304, the response message 370 is demodulated from the total signal 106 as first communication signal 402 and is supplied to the first computer 302.

An alternative to the illustrative embodiment portrayed above is illustrated below:

The communication protocol used for transmitting the digital data may be any desired communication protocol, i.e. the method and arrangements are not limited to the communication protocol based on the TCP/IP standard.

The following publications were cited within the scope of this document:

[1] GB 2 272 350 B

[2] D. Clark, Powerline Communications: Finally ready for prime time?, IEEE Internet Computing, January, February 1998, pages 10-11, 1998

[3] Prospectus from the company Northern Telekom und Norweb, Digital PowerLine: a major new business opportunity for power utilities worldwide, Communications Digital Power Line, published March 18, 1998

**Patent Claims**

1. Communication system

-- comprising an energy supply network that makes a current signal available,

-- comprising a first communication unit that makes a first communication signal available with first payload data that require a great, first bandwidth in the transmission,

-- comprising a second communication unit that makes a second communication signal available with second payload data different from the first payload data that require a smaller, second bandwidth compared to the first bandwidth,

-- comprising a first modulation unit with which the first communication signal can be modulated onto the current signal in a first frequency range,

-- comprising a second modulation unit with which the second communication signal can be modulated onto the current signal in a second frequency range,

and in which communication network

-- the modulation units are configured such that, when the communication signals are modulated on, the first frequency range at least partially comprises a frequency range of higher frequencies than the second frequency range, and in that the modulation of the first communication signal can be implemented such in the first frequency range that a quality of the first payload data does not fall below a predetermined quality given a transmission of the current signal with the first communication signal modulated thereonto via a first transmission path in the energy supply network.

2. Communication network according to claim 1, whereby the second payload data are a request message and the first payload data are a reply message.

3. Communication network according to claim 1 or 2, whereby the payload data are encoded according to a transport control protocol / Internet protocol (TCP/IP).

4. Communication system according to one of the claims 1 through 3, whereby the first transmission path is part of the energy supply network in a building.

5. Communication network according to one of the claims 1 through 4, whereby the current signal with the second communication signal modulated thereon can be transmitted via a second transmission path in the energy supply network.

6. Communication network according to claim 5, whereby the second transmission path is far, far greater than the first transmission path.

7. Communication network according to one of the claims 1 through 6, whereby the first communication unit and/or the second communication unit is/are part of a communication network.

8. Communication network according to claim 7, whereby the communication network is the word [sic] wide web (WWW).

9. Method for forming an overall signal from a current signal and a first communication signal with first payload data that require a great, first bandwidth in the transmission, and/or a second communication signal with payload data differing from the first payload data that require a smaller, second bandwidth compared to the first bandwidth, whereby

-- the first communication signal is modulated onto the current signal in a first frequency range and/or the second communication signal is modulated onto the current signal in a second frequency range;

-- the first frequency range at least partially comprises a frequency range of higher frequencies than the second frequency range;

-- the modulation of the first communication signal ensues such in the first frequency range that a quality of the first payload data does not fall below a predetermined quality given a transmission of the current signal with the first communication signal modulated thereonto via a first transmission path in the energy supply network.

FIG 1

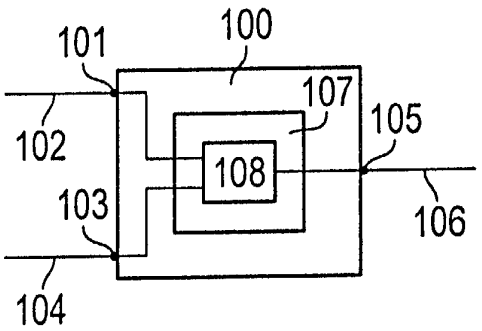
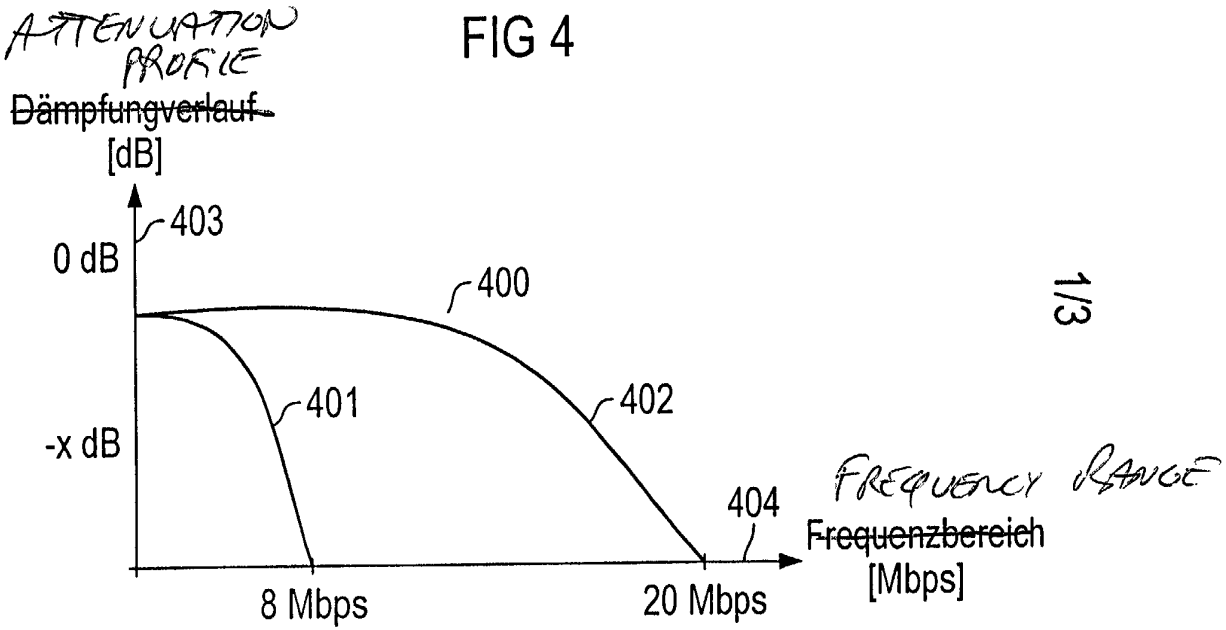



FIG 4



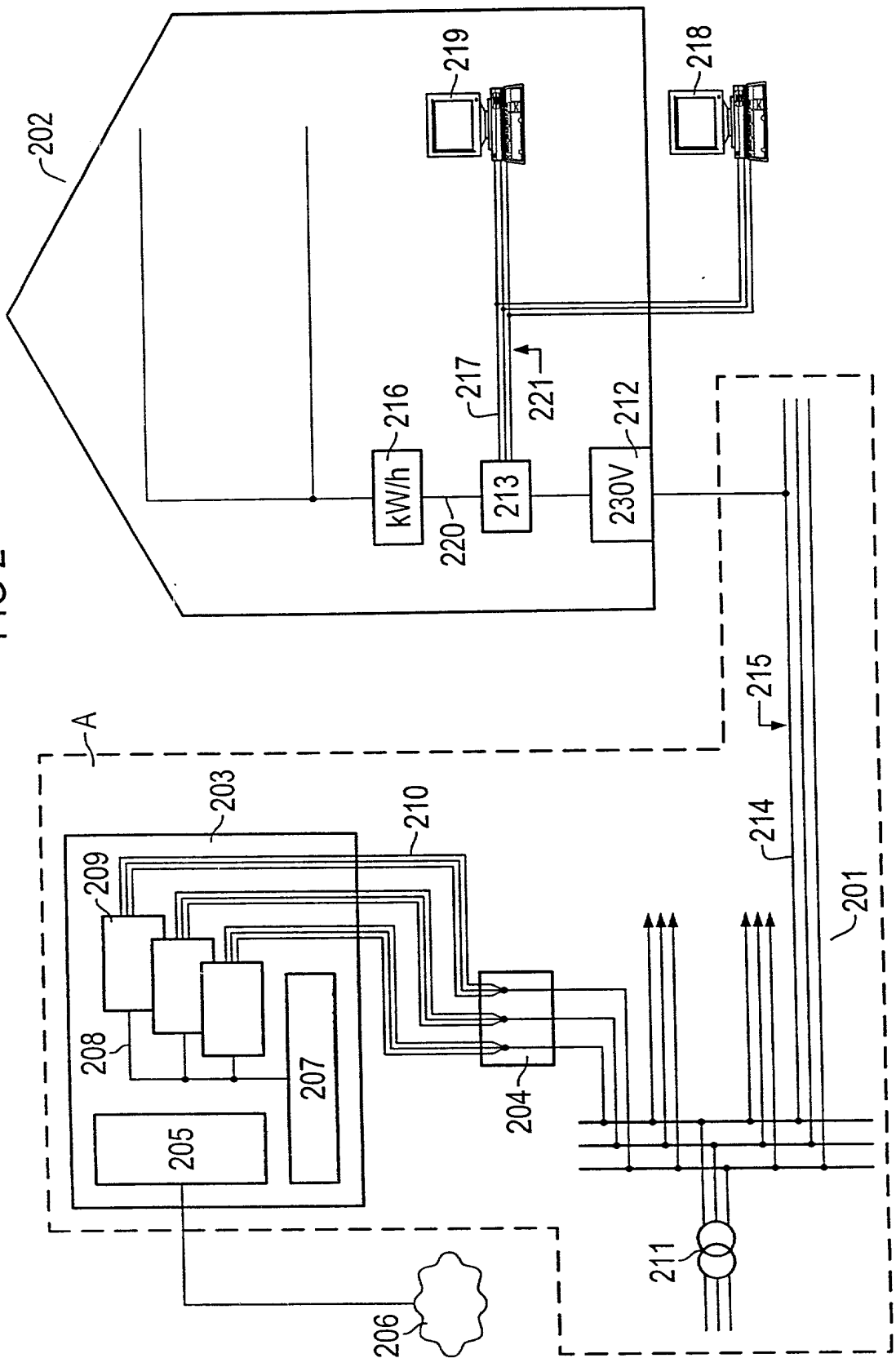
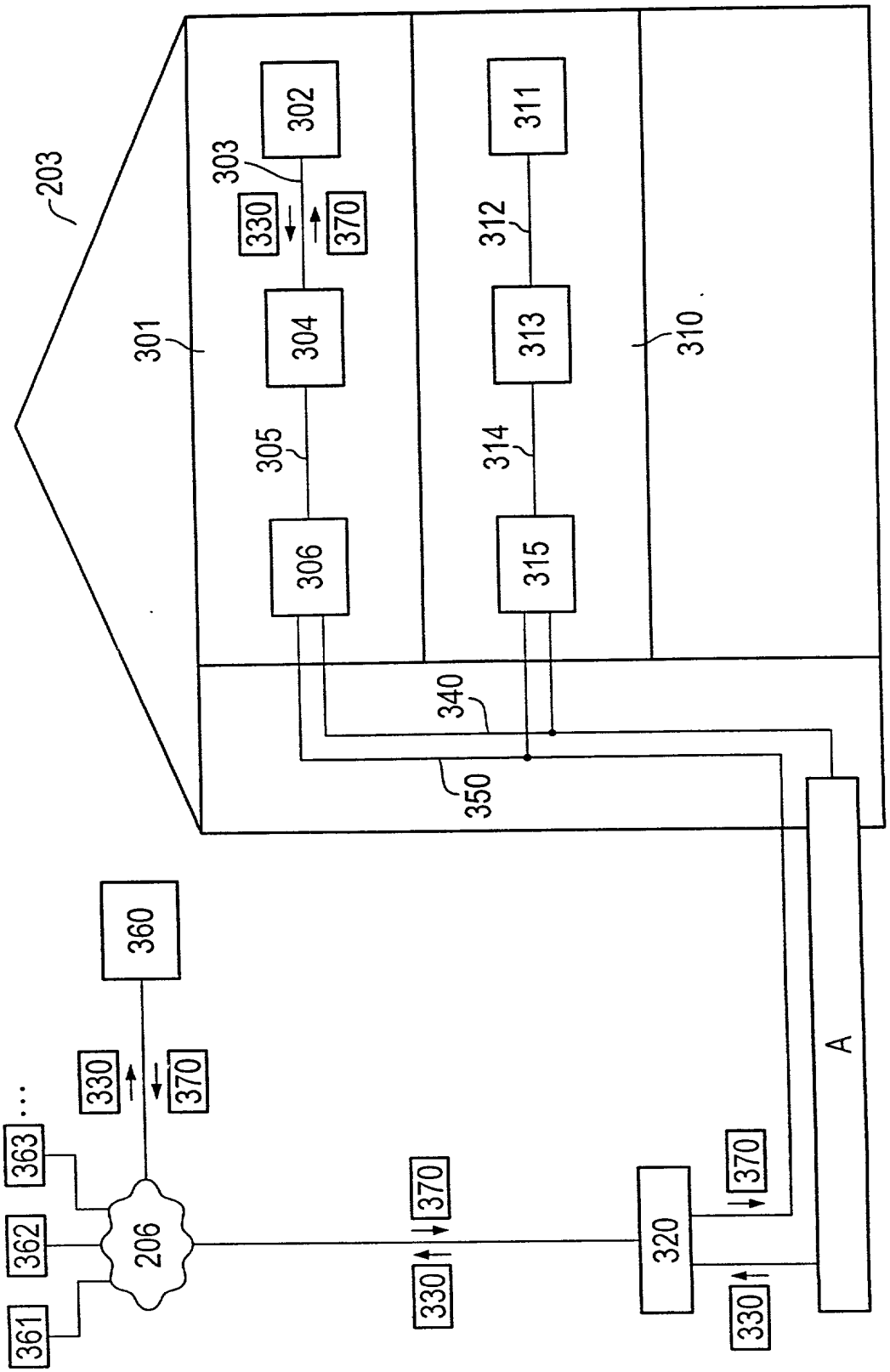

202
219
218
kW/h
216
217
221
213
220
230V
212
215
A
203
210
209
214
201
208
207
205
204
211
206

FIG 2

FIG 3


203
301
302
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206
320
A

# Declaration and Power of Attorney For Patent Application
## *Erklärung Für Patentanmeldungen Mit Vollmacht*
### German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

Anordnung und Verfahren zur Bildung eines Gesamtsignals, Anordnung und Verfahren zur Bildung eines Stromsignals und eines ersten Kommunikationssignals, Kommunikationssystem und Verfahren zur Übertragung eines ersten Gesamtsignals und eines zweiten Gesamtsignals

deren Beschreibung

(zutreffendes ankreuzen)

☒ hier beigefügt ist.

☐ am _____ als
PCT internationale Anmeldung
PCT Anmeldungsnummer _____
eingereicht wurde und am _____
abgeändert wurde (falls tatsächlich abgeändert).

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

_____

the specification of which

(check one)

☐ is attached hereto.

☐ was filed on _____ as
PCT international application
PCT Application No. _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

## German Language Declaration

Prior foreign appplications
Priorität beansprucht

| | | | Priority Claimed | |
|---|---|---|---|---|
| 198 42 226.1 | Germany | 15. September 1998 | ☒ | ☐ |
| (Number)<br>(Nummer) | (Country)<br>(Land) | (Day Month Year Filed)<br>(Tag Monat Jahr eingereicht) | Yes<br>Ja | No<br>Nein |
| | | | ☐ | ☐ |
| (Number)<br>(Nummer) | (Country)<br>(Land) | (Day Month Year Filed)<br>(Tag Monat Jahr eingereicht) | Yes<br>Ja | No<br>Nein |
| | | | ☐ | ☐ |
| (Number)<br>(Nummer) | (Country)<br>(Land) | (Day Month Year Filed)<br>(Tag Monat Jahr eingereicht) | Yes<br>Ja | No<br>Nein |

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35. United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application.

| (Application Serial No.)<br>(Anmeldeseriennummer) | (Filing Date)<br>(Anmeldedatum) | (Status)<br>(patentiert, anhängig, aufgegeben) | (Status)<br>(patented, pending, abandoned) |
|---|---|---|---|
| (Application Serial No.)<br>(Anmeldeseriennummer) | (Filing Date)<br>(Anmeldedatum) | (Status)<br>(patentiert, anhängig, aufgeben) | (Status)<br>(patented, pending, abandoned) |

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## German Language Declaration

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

And I hereby appoint

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*(Supply similar information and signature for third and subsequent joint inventors).*